

NOTES ON GEOGRAPHIC DISTRIBUTION

Mammalia, Chiroptera, Phyllostomidae, *Anoura fistulata*: Distribution extension

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Nectar feeding bats of the genus *Anoura* are a common component of the highlands of the Neotropics. Distribution of *Anoura* species are thought to be primarily influenced by the geologic complexity of the northern portion of South America and particularly by the uplifting of the Andean System (Mantilla-Meluk and Baker 2006). Eight species of *Anoura* are presently recognized including: *A. aequatoris*, *A. cadenai*, *A. caudifer*, *A. cultrata*, *A. fistulata*, *A. geoffroyi*, *A. latidens*, and *A. luismanueli*. All species of *Anoura* are thought to be present in Colombia where the Andean System reaches its maximum geologic complexity (van der Hammen 1974).

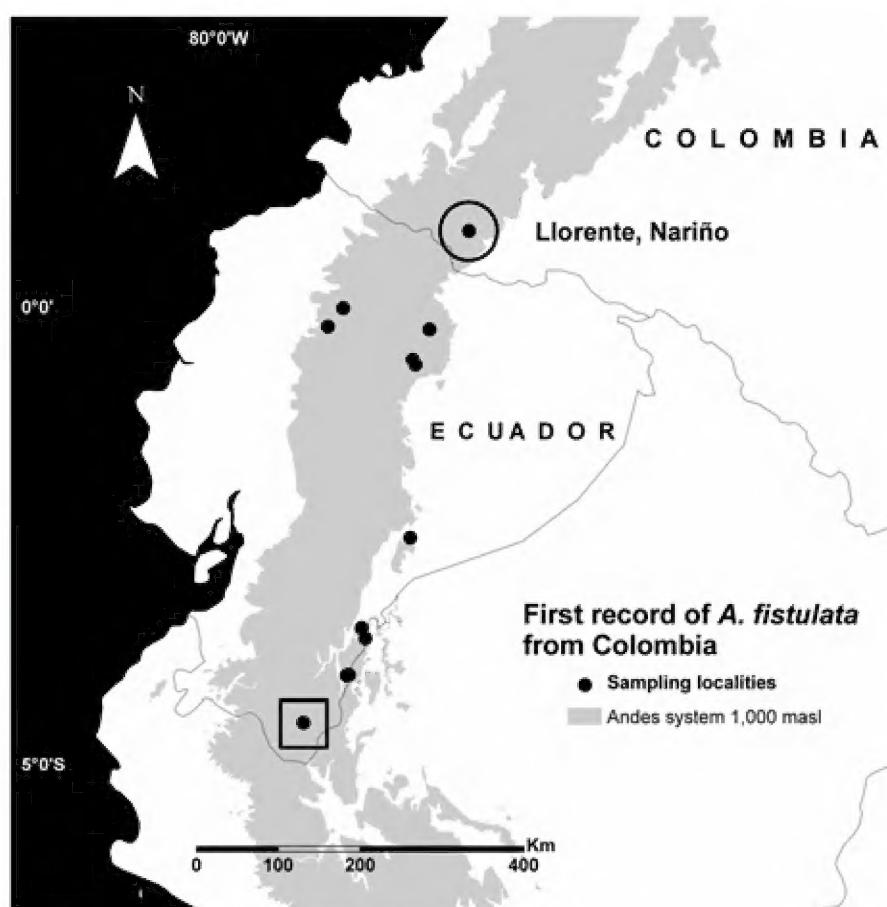


Figure 1. Distribution extension of *A. fistulata*. Black dots represent *A. fistulata* type locality (square) in Ecuador and first confirmed record in Colombia (circle) (FMNH 113512). Sampling localities of *A. fistulata* from Ecuador were obtained from Muchhala et al. (2005).

Anoura fistulata represents one of the largest forms within the *A. caudifer* complex and was originally described from the Provincia Zamora Chichipe, Condor Mirador (03°38'8" S, 78°23' 22" W; 1750 m), on the eastern side of the Andes in Ecuador (Muchhala et al. 2005) (Figure 1). Muchhala et al. (2005) extended the distribution of *A. fistulata* to both sides of the Andes based on specimens from two sampling localities on the western versant of the Ecuadorian Andes and suggested the presence of *A. fistulata* in Colombia. In previous examination of some of the largest Colombian series of specimens of *Anoura* from Colombia, including the collections of the *Instituto de Ciencias Naturales* and the *Instituto Alexander von Humboldt* in Bogotá, Colombia and the National Museum of Natural History the authors failed to document *A. fistulata* specimens from Colombia.

We reviewed the series of Colombian *Anoura* deposited at the Field Museum of Natural History (N=99). Among the large *Anoura* a female specimen from the southeastern portion of the Andes of the Department of Nariño (0°49'0.00" N, 77°15'0.00" W) called our attention due to its resemblance to *A. fistulata*. The above mentioned specimen, catalogued with number FMNH-113512, was collected by Mr. Kjell von Sneider on 23 May 1970 (collector number 1753), who identified it as *A. geoffroyi* based on its large forearm and skull lengths in comparison with typical *A. caudifer* (Figure 2 a-d; Table 1). Large specimens within the complex *A. caudifer* in Colombia have been recognized as *A. cadenai* (Mantilla-Meluk and Baker 2006). Although *A. cadenai* overlaps *A. fistulata* in forearm and skull measurements, the two species can be differentiated by discrete characters

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such as the presence in *A. fistulata* of an enlarged keel on the mandible (Muchhala et al. 2005) that is absent in *A. cadenai*, as well as the presence of a sulcus in the upper canines of *A. cadenai* (Mantilla-Meluk and Baker 2006) that is absent in *A. fistulata* (Figure 2c and 2d). The *Anoura* specimen from Llorente Colombia has an enlarged keel in the mandible and its upper

canines do not have the sulcus typically found in the upper canines of *A. cadenai*. This specimen constitutes the first confirmed record of *A. fistulata* for Colombia. At Llorente, Nariño *A. fistulata* occur in sympatry with *A. geoffroyi* (FMNH 113449, 113482-92, 114029, and 223492) and *A. caudifer* (FMNH 113510-113512).

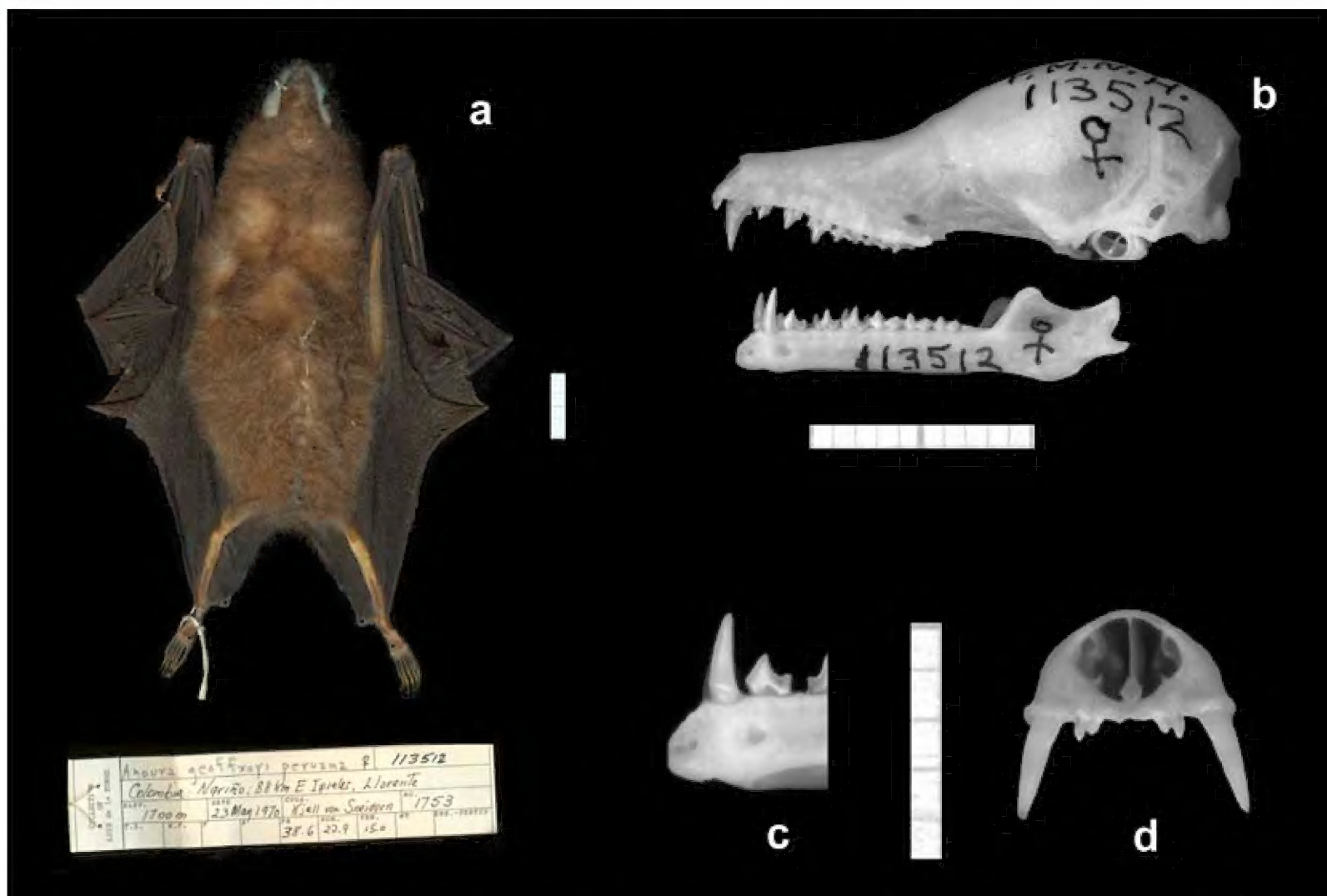


Figure 2. a) Skin and original label of the female *A. fistulata* specimen from Llorente Nariño, Colombia FMNH-113512. The specimen was erroneously identified as *A. geoffroyi* due to its large size in comparison with other *Anoura* species. b) skull and mandible; c) detail of the enlarged keel of *A. fistulata*, and d) detail of the canines without sulcus of *A. fistulata*.

Our *A. fistulata* Colombian record represents a significant extension of distribution of the species and constitutes the northernmost known record for this species. In order to better understand habitat preferences of *A. fistulata*, occurrence patterns were investigated through the generation of a Maximum Entropy niche model of potential distribution (Maxent), following the protocol suggested by Phillips et al. (2006). Sampling localities reported by Muchhala et al. (2005) in addition to the Colombian record presented here

in Figure 1 were used as input for the generation of the Maxent model. The resulting model excluded *A. fistulata* from the Andean piedmont of the Colombian Chocoan Region (occurrence probability less than 30%), considered the preferred habitat of *A. cadenai* (Mantilla-Meluk and Baker 2006). In our *A. fistulata* Maxent model areas with occurrence probabilities greater than 50% were restricted to the eastern versant of the Ecuadorian Andes and could explain the apparent rarity of *A. fistulata* in Colombia (Figure 3).

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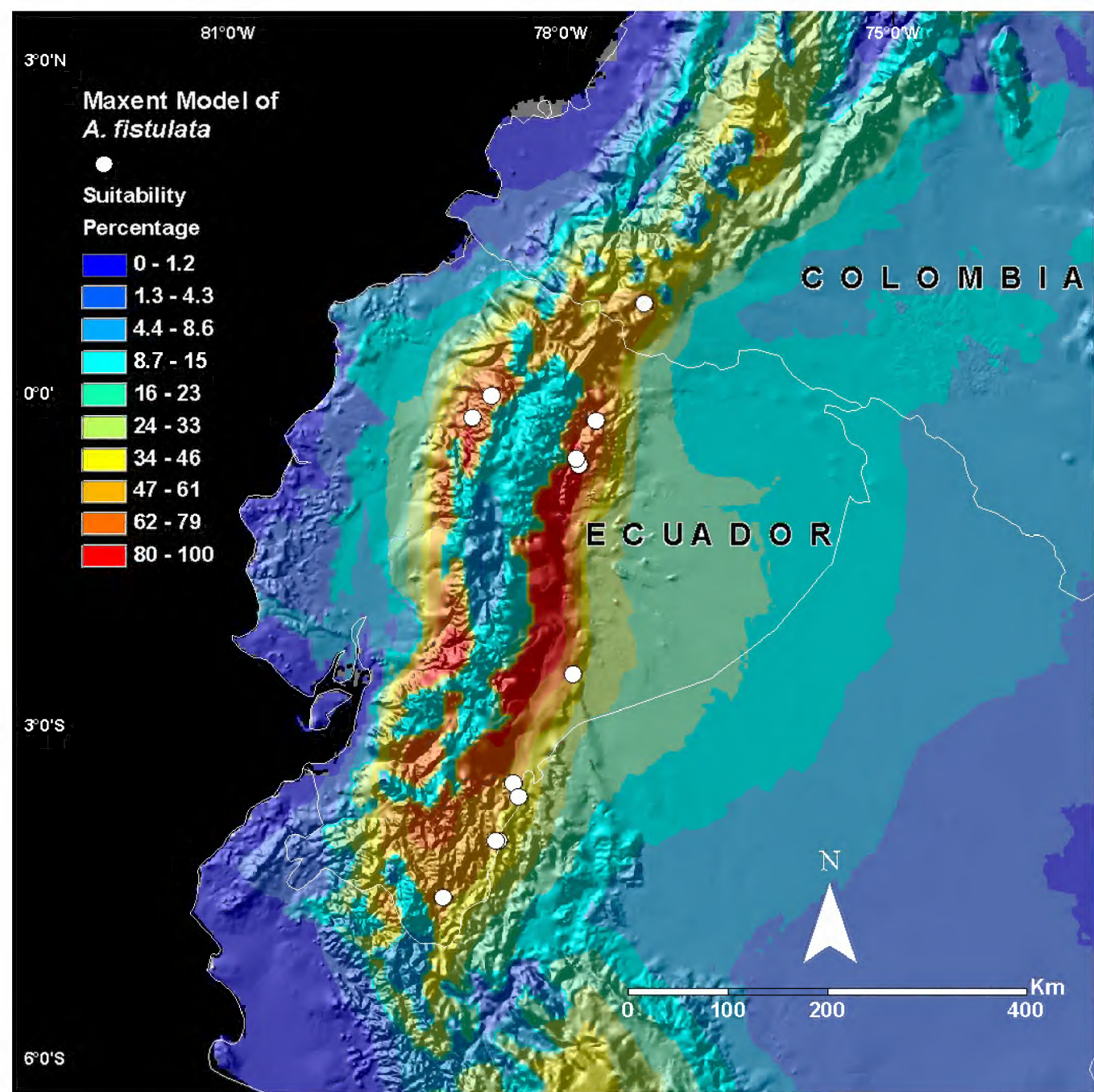


Figure 3. Maxent model of suitability of *A. fistulata* based upon sampling localities reported by Muchhala et al. (2005) and the *A. fistulata* record from Colombia reported in the present work

Table 1. Forearm and skull measurements (in mm) of *A. fistulata* from Llorente, Nariño, Colombia and reported measurements of the *A. fistula* holotype from Condor, Ecuador (Muchhala et al. 2005).

Measurement	<i>A. fistulata</i>	
	Llorente, Colombia FMNH-113512	Holotype (Condor Mirador, Ecuador)
Greatest skull length	24.08	23.5
Condyle-basal length	23.46	23.0
Palatal length	12.80	12.0
Breadth of the postorbital constriction	4.83	4.5
Zygomatic breadth	9.89	9.8
Breadth of the braincase	9.44	9.4
Mastoid breadth	9.02	-
Breadth across the upper canines	4.28	4.4
Breadth across the upper molars	5.47	5.9
Length of the tooth row	8.58	8.6
Mandible length	17.13	17.0
Length of the mandible tooth row	8.95	9.0
Forearm	37.80	37.2

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Literature cited

- Mantilla-Meluk, H. and R. J. Baker. 2006. Systematics of small *Anoura* (Chiroptera: Phyllostomidae) from Colombia, with description of a new species. Occasional Papers, Museum of Texas Tech No. 261.
- Muchhala, N., P. Mena V., and L. Albuja V. 2005. A new species of *Anoura* (Chiroptera: Phyllostomidae) from the Ecuadorian Andes. Journal of Mammalogy 86:457-461.
- Phillips, S. J., R. P. Anderson, and R. E. Schapire. 2006. Maximum entropy modeling of species geographic distributions. Ecological Modelling 190:231-25.
- van der Hammen, T. 1974. The Pleistocene changes in vegetation in South America. Journal of Biogeography 1:3-26 pp.
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